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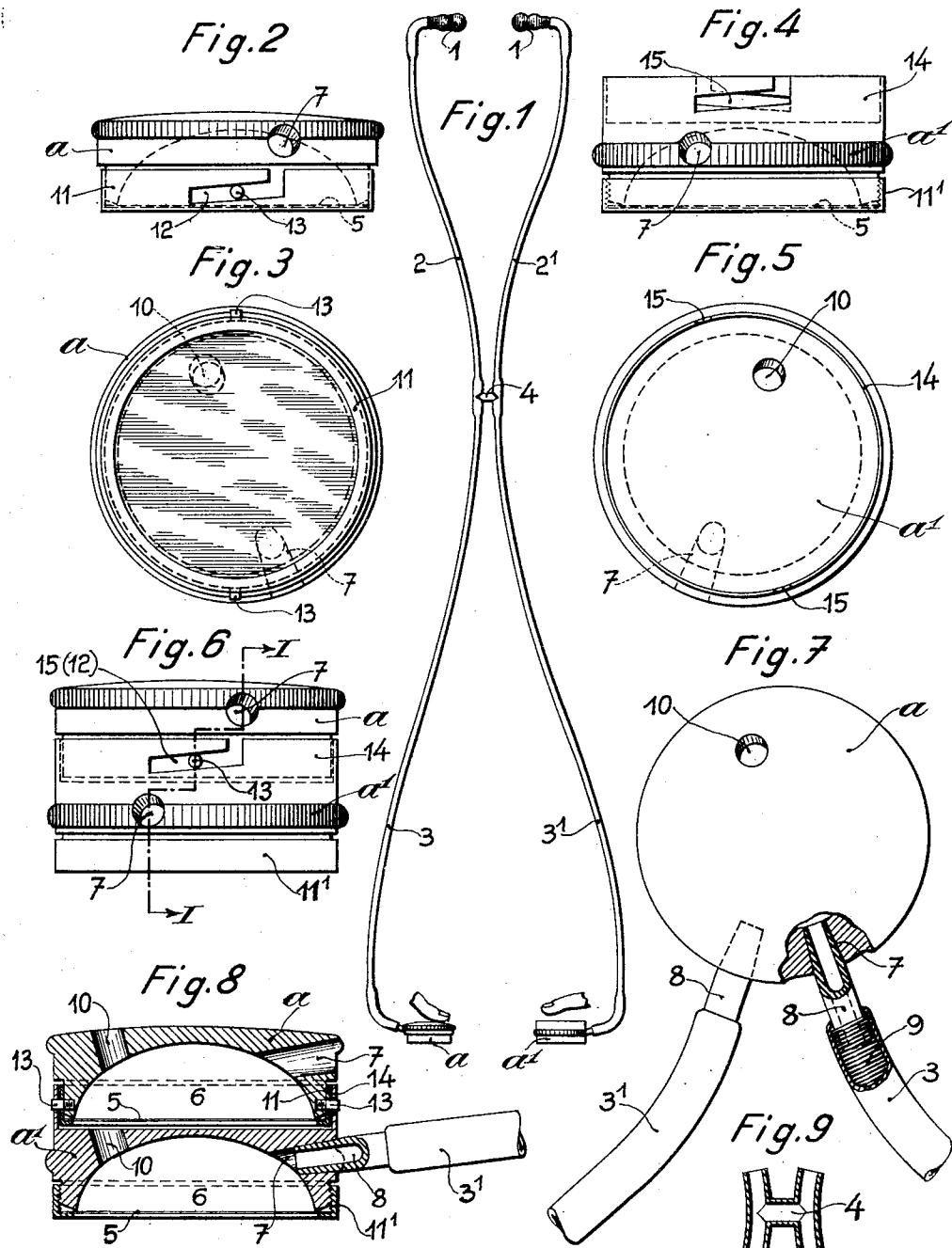
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MEMBRANE STETHOSCOPE-PHONENDOSCOPE FOR COMPARATIVE

AS WELL AS FOR TOPOGRAPHIC AUSCULTATION

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MEMBRANE STETHOSCOPE—PHONENDOSCOPE FOR COMPARATIVE AS WELL AS FOR
TOPOGRAPHIC AUSCULTATION

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The purpose of the membrane stethoscope (phonendoscope) for comparative as well as for topographic auscultation forming the subject-matter of the present invention is to enable, on the one hand, auscultation, as hitherto practised, of various parts of the body, and on the other hand, the very exact, practically simultaneous auscultation of two different parts of the body to be likewise effected. This means, in other words, that this instrument enables the usual comparison of acoustic impressions received from two parts of the body which have to be examined, to be effected simultaneously or substantially simultaneously without, however, having for this purpose to permanently shift the instrument from one place to the other as has been unavoidable up to now.

According to the invention, this membrane stethoscope consists, with the above-mentioned purpose in view, of two essentially similar sound boxes connected to a common ear tube, each of which sound boxes possesses in its casing an opening capable of being easily manually closed which opening connects the sound space situated above its membrane with the outside air, these sound boxes being fitted with coupling organs, by means of which it is possible to couple together the two sound boxes superposed on each other, so as to make them form a single sound box. The openings in the casings of the sound boxes serve to enable the sound boxes to be put in and out of operation alternately in any sequence and with any required rapidity. When the opening is open the membrane of a sound box transfers its vibrations through this opening direct to the outside air instead of transmitting the same to the ear tube, and thus the sound box is in this case mute and inoperative whilst if the opening is closed the membrane sets the air column contained in the listening conduit into vibration so that in this case the stethoscope will be operative and transmit sounds. The putting into and out of operation of the sound boxes by means of these openings is required chiefly in the case of comparative auscultation when two different parts of the body have to be auscultated in rapid succession, and the two sound

boxes of the stethoscope are therefore placed respectively on the parts to be examined. In the case of topographic auscultation, in which case the two sound boxes of the stethoscope are coupled so as to form one sound box, since only one part has to be auscultated, the opening of that sound box which happens to be the lower is closed by the upper sound box, so that in this case the lower sound box is always operative and transmits sounds and it may if necessary be temporarily put out of operation by throttling the corresponding flexible ear tube. 55

The drawings show by way of example one embodiment of the membrane stethoscope forming the subject-matter of the invention. Fig. 1 is drawn to 1/3 scale; Figs. 2-8 are drawn to 2/1 scale, and Fig. 9 to 1/1 scale. 60

Fig. 1 shows a view of the complete stethoscope. 70

Figs. 2 and 3 are respectively a side view and a bottom plan view of one sound box of the stethoscope, whilst Figs. 4 and 5 are respectively a side view and a plan view of the other sound box. Figs. 6 and 7 are respectively a side view and plan of the two sound boxes coupled together so as to form a single sound box, whilst Fig. 8 is an axial section taken along line I—I of Fig. 6. Fig. 9 is a longitudinal section of a detail. 75

The membrane stethoscope consists, as appears from Fig. 1 of the two sound boxes *a* and *a*¹, as also employed in a somewhat different form in the case of phonendoscopes with one sound box only as used hitherto, and of a listening conduit common to both sound boxes, consisting of two flexible ear tubes 2 and 2¹ which can be introduced into the ears by means of the earpieces 1, and of the two sound tubes 3 and 3¹, ending in the sound boxes *a* and *a*¹, and of a common H-shaped sound distribution tube 4 connecting the two sound tubes 3 and 3¹ with the flexible ear tubes 2, 2¹ (Fig. 9). This sound distributing tube 4 connected to the listening conduit enables use of the same flexible ear tubes 2, 2¹ for listening either to the one or to the other sound box, or for listening to both sound boxes simultaneously, the listener using both his ears in each case. Each of the sound 80

boxes a , a^1 , which are preferably of cylindrical shape, possesses a lateral slightly conical opening 7 issuing into the sound space 6 situated above the membrane 5 of the sound box, which openings serve to connect the flexible sound tubes 3, 3^1 . For this purpose, the latter are fitted with conical junction branches 8 at their ends, which fit exactly into the openings 7 of the sound boxes. Each of these junction branches 8 is fixed to a flexible piece of tubing 9, made for instance, of spiral wire, on which the end of the flexible tube 3 or respectively 3^1 is drawn up to enable the latter to be connected with the branch 9. This piece of flexible tubing acts so to speak as a joint, so that the sound boxes a , a^1 connected with the flexible tubes 3 and 3^1 respectively may be placed in any position and thus not only enable freely accessible parts of the body to be auscultated from above, but also enable parts of the body to be auscultated from below, by placing the sound boxes below the body as in the case of persons lying in bed.

Each sound box possesses in its casing an opening 10 leading to sound space 6 (Figs. 5, 7 and 8) which openings enable the putting in and out of operation of the sound boxes a , a^1 in the manner referred to above.

The membranes 5 partitioning off the lower sound spaces 6 of the sound boxes a , a^1 are kept in position by frames 11 and 11^1 respectively which are detachably connected to the sound boxes. For this purpose bayonet slots 12 are provided on two diametrically opposite sides of the frame 11 of one of the sound boxes, viz. of the sound box a , by means of which slots this frame is connected to the lateral pin 13 of the sound box a , (Figs. 2, 3, 6, 8). The frame 11^1 of the other sound box a^1 is provided with an inside thread and is screwed on the bottom end, provided with an outside thread, of the sound box a^1 (Figs. 4 and 8).

The shell of the sound box a^1 is extended upwards over its cover so as to form a box-shaped border 14 (Figs. 4, 5, 6 and 8) serving to join the two sound boxes together to form a single sound box, which border is therefore made sufficiently high and wide to enable frame 11 of the sound box a to fit into it exactly. On this border 14 bayonet slots 15 corresponding to the bayonet slots 12 of the frame 11 of the sound box a are provided. The lateral pins 13 of the sound box are made long enough to enable them to be brought into engagement with the bayonet slots 15 when the sound box a is inserted into the border 14 of the sound box a^1 in order to enable use of the two sound boxes mutually coupled together (Figs. 6 and 8) as a single sound box. In this case, as mentioned above, the opening 10 of the bottom sound box a^1 is closed by the top sound box a ; so that the bottom sound box is rendered operative whilst the top sound box remains inoperative and mute, partly

because its membrane 5 is covered by the bottom sound box a^1 and partly because its opening 10 is open. It is self-evident that the coupling of the sound boxes a and a^1 may, with the same object in view, also be effected in any other desired manner without the substance of the invention being altered thereby.

The method of operating the membrane stethoscope described above is the following:

If comparative auscultation of two different parts of the body is to be effected the instrument is used with sound boxes a and a^1 separated in the way shown in Fig. 1. The investigator places the earpieces 1, 1, of the ear tubes 2, 2^1 into his ears, places the sound boxes at the parts to be auscultated and closes with one finger of each hand the openings 10 of both sound boxes (as shown on the left-hand side of Fig. 1). By alternately lifting or replacing his two fingers in a succession as rapidly as desired the investigator is now able alternately to put the two sound boxes into and out of operation and thus to auscultate in a comparative manner the two parts to be examined.

In order to examine a single part the two sound boxes are mutually coupled with each other in the manner described, after which the membrane stethoscope can be used in the usual manner like an ordinary phonendoscope. For the purpose of storage or transport also it is advisable to mutually couple the two sound boxes.

What I claim is:

1. A membrane stethoscope (phonendoscope) for comparative as well as for topographic auscultation, characterized by two separate but essentially similar phonendoscope sound boxes, connected to a common listening conduit consisting of two flexible tubes, on the covers of which sound boxes openings connecting the space above the membrane with the outer air are provided, and which are fitted with coupling elements by means of which the two sound boxes superposed on each other may be connected so as to form a single sound box.

2. A membrane stethoscope as claimed in claim 1 characterized by the fact that the two flexible tubes of the listening conduit of the stethoscope are mutually connected in a sound-conducting manner by an H-shaped piece of tube.

3. A membrane stethoscope according to claim 1 characterized by the fact that the sound conduit flexible tubes are connected to the sound boxes in an articulate manner by means of pieces of flexible tubes 9.

In testimony whereof I have signed my name to this specification.

DR. EUGEN ZALA.

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